

*If you are using a printed copy of this procedure, and not the on-screen version, then you **MUST** make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A*

## C-A OPERATIONS PROCEDURES MANUAL

### 15.5.43 S.I.P. Maintenance

(Vacuum Group Procedure VA-008.18.1.43)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

#### Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Approved:                     *Signature on File*                     \_\_\_\_\_  
Collider-Accelerator Department Chairman                      Date

S. Gill

Vacuum Group Procedure VA-008.18.1.43  
Original Issue Date: 01/01/00  
Revision 01

**\*\*IMPORTANT\*\***

PRIOR TO THE PERFORMANCE OF ANY WORK WITHIN THE SCOPE OF THIS PROCEDURE, IT IS THE RESPONSIBILITY OF THE SUPERVISOR TO ENSURE THAT ***WORK PLANNING*** HAS BEEN REVIEWED FOR THE PROTECTION OF WORKERS, EQUIPMENT, AND THE ENVIRONMENT.

## **1. DISCUSSION**

- 1.1 This procedure is written so that trained AGS Technicians will be able to measure base pressure current, detect high voltage break-down, and shorts in sputter-ion pumps used in the AGS.
- 1.2 Due to the variety of sputter-ion pumps used a history card for each pump will have to be established. Each pump will be identified by serial number and on each history card a space will be made available listing the expected test results expected test results will be established by the manufacturer of the pump of the pump or the cognizant engineer for the sputter-ion pump.

## **2.0 PRECAUTIONS**

- 2.1 All activity inside the test area shall take place when the Hi-Pot is unplugged and tagged out with a "Red Tag".
- 2.2 The Hi-Pot operator shall observe the following:
  - 2.2.1 Remove conductive jewelry, key rings, etc
  - 2.2.2 Safety glasses must be worn.
- 2.3 A test area shall be cordoned off and signs posted.
  - 2.3.1 Barriers (red fence) shall be placed a minimum of 3 feet away from pump being tested.
  - 2.3.2 If caution high voltage barrier tape is to be used, a larger test area must be established to prevent and individual from accidentally coming in contact with hazards.
- 2.4 Affected person shall be notified in the local area when testing begins and ends.

## **3. PREREQUISITES**

- 3.1 In order to perform this procedure, technicians must have passed the following:
  - (1) 15.17.00.01 Affected Persons
  - (2) 15.17.00.02 Lockout Tagout
  - (3) 15.17.00.04 Electrical Safety
  - (4) An Authorization Check Off Procedure

## **4. LIMITATIONS AND ACTIONS**

- 4.1 Procedure shall not be performed around water or during periods of high humidity.

## **5. TEST AND SPECIAL EQUIPMENT**

- 5.1 High voltage potential power supply (Hi-Pot) capable of delivering 5300 VDC, start-up current min. 200 milli-amps and an ampere output meter capable of reading nano-amps.
- 5.2 Fluke Meter or equal, capable of reading Ohms.
- 5.3 OSHA Approved ground stick.
- 5.4 Safety Glasses.

- 5.5 Barrier (Red Fence) with danger high voltage signs and/or caution high voltage tape.

**6. TEST SET-UP AND PRE-TEST PROCEDURES**

- 6.1 Place the ion-pump inside the test area or install barrier around pump to be tested.
- 6.2 Establish history card for pump and determine expected test results.
- 6.3 Inspection pump for damage, list any discrepancies on history card and end test procedure until repairs can be made.
- 6.4 Check pump for short, using a Fluke Meter Read Resistance across high voltage feed-thru and pump body, should read open circuit if shorted, end test procedure until repairs can be made.
- 6.5 Place the Hi-Pot outside the test area.
- 6.6 Verify all required grounds are connected properly.
  - 6.6.1 Hi-Pot grounded
  - 6.6.2 Ground stick grounded to Hi-Pot.
- 6.7 The Hi-Pot leads shall be run under or thru the barrier.
- 6.8 Verify each time, prior to the use of the Hi-Pot the following:

**WARNING:**

Make sure Hi-Pot is unplugged, all switches are off, meters read zero and test leads have been grounded.

- 6.8.1 Short the leads of the Hi-Pot together, try to raise the voltage and confirm that the Hi-Pot “Trips Off”. Watch for movement for in current meter.
  - 6.8.2 Turn voltage control knob on Hi-Pot to “0”, verify voltage and current meters read “0” and then turn Hi-Pot “Off”.
  - 6.8.3 Wait two minutes, unplug the Hi-Pot and then enter test area and ground test leads with ground stick.
  - 6.8.4 With the leads of the Hi-Pot “Open Circuit” check that the voltage can be raised and lowered to zero on the meter.
  - 6.8.5 Turn voltage control knob on Hi-Pot to “0”, verify voltage and current meters read “0” and then turn Hi-Pot “Off”.
  - 6.8.6 Wait two minutes, unplug the Hi-Pot and then enter test area and ground test leads with ground stick.
- 6.9 Connect Hi-Pot test leads to ion pump.
  - 6.9.1 Connect high voltage cable from Hi-Pot to the high voltage feed-thru on the ion pump.
  - 6.9.2 Connect the return lead from the Hi-Pot to the body of the ion pump.

**7.0 TEST PROCEDURE**

- 7.1 If the “Ion Pump is at Air”, voltage shall be raised slowly to 4000 VDC and held there for a minimum of 10 seconds and a maximum of 1 minute, while observing the current meter on the Hi-Pot.

- 7.2 If “Ion Pump is Under Good Vacuum”, voltage shall be raised slowly to 5300 VDC and held there VDC and held there for a minimum of 5 minutes and a maximum of 4 hours, while observing the current meter on the Hi-Pot.
- 7.2.1 If at any time during this test, current greater than 0.2 amp, or as noted on the history card, for more than two minutes is observed on the Hi-Pot or an audible sound of high voltage breaking down is heard, testing should be ended immediately by turning voltage on Hi-Pot to “0”. Note failure on ion pump history card.
- 7.2.2 If after 5 minutes or in less than 4 hours the current on the Hi-Pot meter, meets the test parameters set forth by the pump manufacturer or the cognizant engineer, a current value and time will be entered in the appropriate box on the ion pump history card.. Then turn the voltage on the Hi-Pot to “0”.
- 7.2.3 If after 4 hours the current on the Hi-Pot meter does not meet the test parameters set forth by the pump manufacturer or the cognizant engineer, a current value and time will be entered in the appropriate box on the ion pump history card with the word “Failure”. Then turn the voltage on the Hi-Pot to “0”.
- 7.2.4 Verify that the voltage and current meters on the Hi-Pot read “0”, then turn the Hi-Pot “Off”.
- 7.2.5 Wait two minutes, unplug the Hi-Pot and then enter the test area and ground the test leads with ground stick.
- 7.3 Upon completion of testing remove ion pump from test area for storage, repair or immediate use.

## **8. ACCEPTANCE CRITERIA**

- 8.1 The ion pump is acceptable if it meets the test parameters set by the pump manufacturer or the cognizant engineer.

## **9. FINAL CONDITIONS**

- 9.1 Make sure ion pump history cards are complete.
- 9.2 Notify interested parties of test results.
- 9.3 Upon completion of testing, remove barrier, signs and test equipment. Notify affected person testing is over.

## **10. APPENDICES**

- 10.1 ION Pump history card.

**ION PUMP HISTORY CARD**

SERIAL NUMBER \_\_\_\_\_

DATE RECEIVED \_\_\_\_\_

Check if required			Pass	Fail
<input type="checkbox"/>	1) Mechanical Measurement	Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	2) Pump weight _____ lbs	Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	3) Pump Lifting Bracket	Angle of inclination <10 degrees Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	4) Base pressure current: Start-up Current _____ A    Voltage _____ V Current after 4 hours _____ A    Voltage _____ V	Date _____ Technician _____ Current must be < ??????????	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	5) Leakage current _____ A	Date _____ Technician _____ Current must be <.01 microAmps	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	6) Vent Pump	Date _____ Technician _____ Under Vacuum?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	7) Remove peel-off ring: Flange sealing surface is clean & free of scratches & nicks.	Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	8) Leakcheck (only required if pump failed test number 6)		<input type="checkbox"/>	<input type="checkbox"/>
Use page 2 only if test 9), 10), or 11) is required				
<input type="checkbox"/>	9) Base Pressure Measurement		<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	10) Pumping Speed Measurements	Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	11) Disassemble Pump	Date _____ Technician _____	<input type="checkbox"/>	<input type="checkbox"/>